Pine Wilt Management and Control Considerations

Pine wilt infects pines across much of central and eastern areas of the state and is progressing into western counties. Some cities in central Kansas are minimizing the impact in their communities with management programs. Below are some considerations for the landowner, nurserymen, arborist, and community or rural forester in local eradication or minimizing the impact of pine wilt upon windbreaks, landscapes, and production areas for all of Kansas. These considerations are based upon published scientific information and observations and professional recommendations from personnel within the Kansas Department of Agriculture, Kansas Forest Service, and Kansas State University Extension Service.

Susceptible hosts in Kansas by order of susceptibility:

1. Scotch and Mugo
2. Austrian
3. White pine (few reports in heavily infected areas)
4. Ponderosa (not considered a susceptible host to the disease)

Important aspects of the disease cycle for management:

- In Kansas, the disease moves primarily from tree to tree and location to location by the Carolina pine sawyer, *Monochamus carolinensis*. The pine sawyer can travel considerable distance during its life but most individuals stay close to the area where they emerged.
- The pine sawyer transmits the pine wood nematode that causes the disease during maturation feeding (young adulthood to sexual maturity) on pine needles and shoots. Some transmission is also believed to occur during oviposition (laying of eggs in the wood of the tree).

Figure 1. A male pine sawyer, *M. carolinensis*, and round exit hole (5mm diameter).

- Pine sawyers begin emerging from pine wood in the latter half of May and continue through the summer into early fall. Adults are active to early November in much of Kansas. Trapping and field observations in Kansas support that the sawyer has a staggered emergence pattern and one generation per year.
- Sawyers seek out freshly cut, dead, or dying trees to lay their eggs in. This wood is where the insect for the following year overwinters and emerge.
- One tree may contain hundreds of sawyer larvae in the winter.
- There is scientific evidence that pine wood nematodes can infect wounded root systems without the sawyer.
- Root systems between pines of the same species may graft.
- Symptoms include whole trees or bushes dying or dead to single branch flagging of dead branches seen with Scotch pine. Temperature and moisture stress enhance symptom development.

Figure 2. In the first image, the nursery tree to the left is dying from pine wilt disease and demonstates the whole tree symptom. In the second and third image, Scotch pine branches are flagged (winter) and the tree is dead the following spring.

- Trees older than ten years old have higher incidences of disease compared to younger trees.
- Human movement of firewood, packing material, and nursery trees (latent infection) from infected areas to non-infected areas can move the nematode and sawyer long distances.

Management Recommendations:

- Pine wilt can be diagnosed by testing the dead branches or trunk of a tree. In most cases, sample the wood next to the trunk from dead branches that have needles attached from the current season.

Figure 3. Here is an example of sampling a pine branch next to the trunk. Cut a stub about 5 inches from the trunk. Cut two to three disks (about ½ inch thick) from a branch and combine with discs from two other branches, this makes an excellent sample.

- Education of the public, parks personnel, nurseryman, and arborists on this issue is vital to early detection, proper disposal, and management.
- Monitoring for disease in an area is best conducted from September through the following March. Symptoms may develop differently based upon environmental conditions. During hot and dry conditions found in summer or early fall, infected trees die quickly in times of stress. In cooler or wetter conditions, trees slowly succumb to the disease over several months compared to a few weeks during hot dry conditions.
- Tree removal is the best control or eradication measure available. Trees diagnosed with pine wilt are best removed and burned during **winter months**. *The basis of this recommendation comes from the fact that sawyers seek out dead or dying trees to lay their eggs and if left standing, a dead tree may attract several females over the summer and fall to lay their eggs in the wood. Removal and destruction of the tree in the winter then functions as an essential trap crop for management destroying the new (only) generation of sawyers for the spring. If removal of trees occurs in the summer and early fall, one may only remove the nematode in the wood but active sawyers in the area still carry the disease agent and may disperse greater distances if disturbed or a brood tree is not nearby. Another advantage of destroying trees in the winter is that it poses less risk of uncontrolled fire for landfills and private burn sites. In summary, the removal any time of a pine wilt tree is desirable even if the prospect for optimum results is greater during the winter.*
- Pesticides: many foliar insecticides will kill beetles but are not cost feasible because of the long time-period of adult beetle activity. For systemic insecticides, sawyer larvae bore deep into the wood where these materials are not always effective. In areas where the disease is known to occur, highly prized trees can be protected by preventative trunk injections that target the nematode and not the beetle.
- Infected trees if left to stand can provide a source of disease and insects for more than a year.

- Chipping of wood and burying are two other alternatives to burning the wood. It is important that wood of trunks or branches of 1 inch in diameter or greater be chipped, buried, or burned.
- Chips or wood mulch from an infected pine should not be placed on or near pine trees. Although the chance of infection is low, research suggests that infection is possible from this activity. Use the pine mulch on other tree species.
- Do not use infected wood for firewood unless it is immediate and complete. In brush refuse dumps or similar sites, firewood cutting should be prohibited because of the risk of transportation of the pest complex.
- Monitor new plantings of larger landscaped trees for pine wilt. Trees dug in infested production fields and moved may show no outward symptom of disease for weeks or months and simply die. Landowners or landscapers may believe it was transplant shock whereas pine wilt may be the culprit. In non-infested areas, landscaped trees should come from local nursery production and not retail centers handling pines from other areas or states.
- Landfill operators whom manage burn pits are important partners in community programs. The operator needs to be informed on handling of this infested plant material and restricting firewood cutting.
- Landowners should monitor for 12 months a removal site for disease status when other pines are in the immediate area. Infected pines may remain asymptomatic for periods over a year especially under cooler wet conditions. New symptomatic trees may appear over time from latent infections or remaining sawyers.
- Landscapes, windbreaks, and wildlife plantings should be diversified in plant species. A large planting of pines is not recommended anywhere in the state.

October 2010